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(71) Applicant(s)  
**Robert Bosch GmbH**

(72) Inventor(s)  
**Elmar Giehler; Achim Wach; Karl-Heinz Kaiser**

(74) Agent/Attorney  
**Callinan Lawrie, Private Bag 7, KEW VIC 3101**

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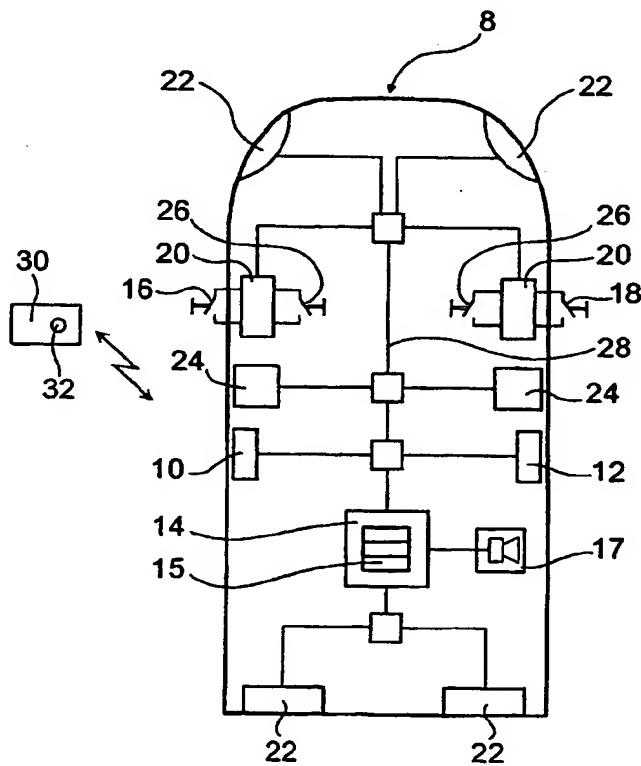
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- (21) Internationales Aktenzeichen: PCT/DE00/01560 (72) Erfinder; und
- (22) Internationales Anmeldedatum: 18. Mai 2000 (18.05.2000) (75) Erfinder/Anmelder (nur für US): GIEHLER, Elmar [DE/DE]; Bei den Gaerten 18, D-70499 Stuttgart (DE). WACH, Achim [DE/DE]; Traminerweg 1, D-71706 Markgroeningen (DE). KAISER, Karl-Heinz [DE/DE]; Uracher Weg 12, D-71732 Tamm (DE).
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(54) Title: METHOD FOR LOCKING A MOTOR VEHICLE IN A KEYLESS MANNER

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**Method for locking a motor vehicle in a keyless manner.**

**5 Prior Art**

- The invention relates to a method for locking a motor vehicle in a keyless manner. A keyless entry system for vehicles with a portable transmitter/receiver is already known from EP 158 354 B1. On the basis of a signal transmitted by the transmitter/receiver, the authority of the user is checked as to whether right to access and to driving of the vehicle is received for the vehicle. In order to prevent the transmitter/receiver from being locked inside the car, the user can, by means of a certain locking, be alerted by an alarm signal to the fact that the transmitter/receiver is still in the interior of the vehicle. The final locking of the vehicle, however, is not implemented until a certain period of time has lapsed, in order to allow the user to retrieve the transmitter/receiver from inside the vehicle within this time span. If the user neglects to do so, the vehicle is locked and the transmitter/receiver inside the vehicle is deactivated. Entry to the vehicle is then only possible by using a mechanical vehicle key.
- 20 If the user does not react soon enough to the emitted warning signal, an involved process is required in order to gain entry again to the vehicle. The object of the invention is to provide a user-friendly operating concept without neglecting the security against unauthorised use.

**25 Summary of the Invention**

According to the present invention there is provided a method for keyless locking of a motor vehicle, with:

- 30 at least one transponder, which exchanges a code with at least one transmitter/receiver on said motor vehicle;
- a control device which compares said code with an expected code, and, if they match, controls a locking-system of said motor vehicle in the sense of locking said motor vehicle;
- at least one indicating-means controlled by said control device; and

at least one operating element by means of whose operation a locking command is generated, wherein in a first step a search signal is transmitted by said at least one transmitter/receiver, when said at least one operating element is operated, in order to determine the position of said at least one transponder on the basis of a code transmitted back by the at least one transponder in response to said search signal, and wherein, in a second step, said at least one indicating-means is controlled if at least one transponder is situated inside said motor vehicle and/or if at least one further transponder is situated in an outside region, on the side of said motor vehicle, opposite the operated operating element, and wherein, in a third step the locking-system of said motor vehicle is controlled in the sense of locking said motor vehicle, if said at least one operating element is operated again.

### **Advantages of the invention**

The method of the invention for keyless locking of a vehicle includes a transponder, which exchanges a code with a transmitter/receiver. A control device compares the code with the expected code and, if a match is established, controls a locking system of the vehicle, by means of locking it. The control device also serves to control a display or indicating means. When a control or operating element is activated, a control command is produced. In a first step the transmitter/receiver transmits a search signal when an activation of the control element takes place in order, by means of the signals returned by the transponder, to determine the position of the transponder. The display means is controlled in a second step when the transponder is inside the vehicle or on a side of the vehicle opposite the activated operating element. In a third step the locking system is controlled in that locking takes place when the locking system is actuated again. The display means gives the user a clear indication that he is about to leave his transponder inside the vehicle. Thus the user is given the opportunity to retrieve the transponder from the vehicle. The display means is also triggered when the front seat passenger has a transponder but the driver actuates the operating element on the driver's side in order to initiate a locking process. In this case the locking does not take place immediately, rather the same warning sequence as in the case that the transponder is inside the vehicle. On the other hand, the locking is not implemented immediately when the transponder is on the same side of the vehicle on which the operating element was actuated. By this means the situation is covered in which an unauthorised person on the passenger's side would want to effect a locking when the driver is, at the same time, with the right transponder on the driver's side. In this case the

locking initially fails and is only carried out upon a second attempt to actuate the operating element. However, this action is preceded by the display of a warning signal, so that the user is made aware of the critical situation.

- 5 In an advantageous further development it is planned that the locking system is controlled in the third step in such a way that an opening of the vehicle door is possible only by means of an operating element situated inside the vehicle. Thus a front seat passenger inside the vehicle, who carries a transponder with him, can leave the vehicle in order to avoid being locked inside the vehicle. In an advantageous further development this  
10 possibility is provided for a given period of time. When this time has elapsed, the locking system no longer allows an opening by means of the internal operating element. Thus, in the event of a possible break-in attempt, the locking system reaches a state in which a thief is prevented from opening the door by breaking, eg. the side window of the vehicle and using the internal operating element.
- 15 An advantageous embodiment provides, in the third step, that the transponders recognised inside the vehicle are deactivated in such a way that a code transmitted from them is not recognised as permissible. The misuse of transponders left inside the vehicle is no longer possible. Furthermore, with the deactivating of the transponder in a storage or memory unit inside the vehicle, additional information such as the time of day or the mileage reading can be stored. These data can be used as evidence provided to an insurer.
- 20 A practical embodiment provides for activation of the transponders deactivated in the third step on unlocking of the locking system. A code exchange with a transponder considered as valid precedes the unlocking. By this means it is ensured that an authorised transponder user has access to the transponder in the interior of the vehicle. For a person breaking in, however, the transponder inside the vehicle is completely worthless, because the information on the transponder regarding deactivation is stored in the control device. A person seeking to break in has more difficulty in accessing this information.
- 25
- 30 **Brief description of the drawings.**

An embodiment of the invention is represented in the drawings and will be described in some detail in the following.

Figure 1 shows a block diagram and Figure 2 a flow chart of the preferred embodiment.

## 5 Detailed description of the preferred embodiment

An external light 22 of the vehicle 8 is controlled via a bus system 28 by a control device 14. On the left side of the vehicle 8 is a left external operating element 16, preferably in the vicinity of the door handle, and on the right side of the vehicle a right external 10 operating element 18. In the interior of the vehicle 8 are two internal operating elements 26. The switching signals of the external operating elements 16, 18 and the internal operating elements 26 are relayed from a signal detection 20 to the bus system 28. A transponder 30 provided with a transponder operating element 32 exchanges signals with a left transmitter/receiver 10 located on the left side of the vehicle 8 or with a right 15 transmitter/receiver 12 located on the right side of the vehicle. Left and right transmitter/receivers 10, 12 are also connected to the control device 14 via the bus system 28. The locking and unlocking of the vehicle doors is assumed by the locking system 24, which, for example, is designed as an electronically operable lock. The locking system 24 is also in a position to exchange signals with the control device 14 via the bus system 28. 20 Also contained in the control device 14 is a storage unit 15. The control device 14 controls a horn 17.

The embodiment will be described on the basis of the flow chart according to Figure 2. In the initial state, Step 101, the motor of the vehicle 8 is switched off, the driver has to leave 25 the vehicle 8 and his door is closed. He would like now to lock the vehicle 8. The left and right external operating elements 16, 18 are monitored for an actuation. If the output signal of one of the external operating elements 16, 18, changes, the signal detection 20 relays the operating process interpreted as a locking command over the bus system 28 to the control device 14. As an alternative operating process, an activation of the transponder 30 operating element 32 could cause the transponder to transmit a locking command, relayed via the transmitter/receivers 10, 12 and the bus system 28 to the control device 14. Only when one of these operating processes is recognised does one proceed to Step 105. In this step the control device 14 causes the transmitter/receiver 10, 12 to transmit a search signal. Left and right transmitter/receivers 10, 12 are preferably arranged on the so-called B-

pillars of the vehicle. By means of an appropriate controlling of the transmitter/receivers 10, 12, an electromagnetic signal is emitted both in the interior and to the left and right exterior of the vehicle. By means of the search signal, the transponders 30 in the detection range are caused to return a response signal. In order to obtain a clear allocation of several 5 transponders 30, a corresponding time slot will be allocated to each of the transponders 30 known by the control device 14, to be reliable, within which the response signal of the respective transponder 30 is expected.

- A first transponder transmits its response signal within a first time slot, a second 10 transponder within a subsequent second time slot, etc. On the basis of this time allocation control device 14 determines which transponders 30 are situated in the detection range. The control device 14 determines, on the basis of the incoming transmitter/receiver signals 15 the position of the respective transponders 30. If a transponder 30 is in the left external range, only one signal is received by the left transmitter/receiver 10 within the corresponding time slot. In the case of a transponder 30 being in the interior of the vehicle both the left and the right transmitter/receiver 10, 12 receive a response signal from the transponder 30. A response signal received only from the right transmitter/receiver 12 indicates the position of the transponder 30 to be in the right external area.
- 20 On the basis of the incoming transmitter/receiver signals the control device 14 checks whether one of the following conditions is fulfilled, Step 107. If at least one transponder 30 in the interior of the vehicle 8 and/or if at least one further transponder 30 is recognised in the outer area, opposite the actuated operating element 16, 18, which triggered the locking command, the system carries out the actions in Step 109. Thus for example, the 25 system switches to step 109 if the driver without the transponder actuates the left external operating element 16 for the purpose of locking it and a passenger with a transponder is in the right external area. This checks whether the locking is carried out immediately only if the driver with respective transponder 30 has actuated the left external operating element 16. If this is the case, the locking is carried out, Step 108. Otherwise, the control device 30 14 controls the external lighting 22 and/or the horn 17 by way of a warning, in order to alert the user to an unusual transponder position, Step 109. The locking is, however, not yet carried out. This takes place only when an external operating element 16, 18 and/or the transponder operating element 32 is actuated again. The corresponding interrogation on actuation takes place in Step 111. The user must then become active again in order to

bring about the locking. It is therefore to be assumed that he has become aware of the critical transponder position but accepts it approvingly. Following a successful actuation of the external operating elements 16, 18 the locking system 24 is controlled in that a locking takes place and a timer is started, Step 113. By locking, a situation is understood  
5 which prevents the opening of the door by means of the door handle, allowing, however, an opening by means of the internal operating elements 26.

- Should there be a further person inside the vehicle 8, he can leave the vehicle until the timer reaches the predetermined time span. This condition is checked in Step 115. Once  
10 the time period has elapsed, the vehicle is locked, so that an opening of the door is possible neither from the inside nor from the outside, Step 117. With the locking of the door of the vehicle 8 the transponder 30 inside the vehicle, which is determined in the interrogation  
107, is deactivated. Information regarding this is stored in the control device 14, which a transponder 30 in the inside does not recognise as permissible and therefore neither a  
15 locking, an unlocking nor authorisation to drive the vehicle 8 can be effected. Alongside the deactivation information of the transponder 30 inside the vehicle, additional information is stored in the storage unit 15, which describes, for example, the time or the mileage of the transponder deactivation.
- 20 An activation of the deactivated transponder 30 can take place when the vehicle 8 is unlocked in the regular way with the aid of a valid transponder 30. It can therefore be assumed that an authorised user obtains access to the internal transponder 30. The warning issued in Step 109 can be shown on a display in the vehicle 8. An announcement follows,  
25 that a transponder 30 is inside the vehicle or that the transponder 30 is in the adjacent outside area. Corresponding speech output can also be provided.

The claims defining the invention are as follows:

1. A method for keyless locking of a motor vehicle, with:  
at least one transponder, which exchanges a code with at least one  
transmitter/receiver on said motor vehicle;  
a control device which compares said code with an expected code, and, if they  
match, controls a locking-system of said motor vehicle in the sense of locking said motor  
vehicle;  
at least one indicating-means controlled by said control device; and  
10 at least one operating element by means of whose operation a locking command is  
generated, wherein in a first step a search signal is transmitted by said at least one  
transmitter/receiver, when said at least one operating element is operated, in order to  
determine the position of said at least one transponder on the basis of a code transmitted  
back by the at least one transponder in response to said search signal, and wherein, in a  
15 second step, said at least one indicating-means is controlled if at least one transponder is  
situated inside said motor vehicle and/or if at least one further transponder is situated in an  
outside region, on the side of said motor vehicle, opposite the operated operating element,  
and wherein, in a third step the locking-system of said motor vehicle is controlled in the  
sense of locking said motor vehicle, if said at least one operating element is operated again.  
20
2. The method as claimed in Claim 1, wherein in the third step said locking-  
system of said motor vehicle is controlled in the sense of locking said motor vehicle, in  
such a way that opening of a vehicle door is only possible by means of at least one internal  
operating element located inside said motor vehicle.  
25
3. The method as claimed in any one of the preceding claims, wherein in the  
third step, said locking-system of said motor vehicle is controlled in the sense of locking  
said motor vehicle, in such a way that opening of a vehicle door by means of at least one  
internal operating element of said motor vehicle is only possible for a predefined period of  
time.  
30
4. The method as claimed in claim 3, wherein after said predefined period of  
time has elapsed, said motor vehicle door cannot be opened by means of said at least one  
internal operating element of said motor vehicle.

5. The method as claimed in any one of the preceding claims, wherein in the third step, after a predefined period of time has elapsed transponders detected as being inside said motor vehicle are deactivated, and therefore a code transmitted by these  
5 transponders is no longer recognised as valid.

6. The method as claimed in claim 5, wherein with the deactivation of the transponders located inside said motor vehicle, an additional item of information is recorded in a memory unit.

10

7. The method as claimed in claim 5 or claim 6, wherein activation of the transponders that have been deactivated in the third step occurs with the unlocking of the locking-system of the motor vehicle.

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8. A method for keyless locking of a motor vehicle, substantially as hereinbefore described with reference to the accompanying drawings.

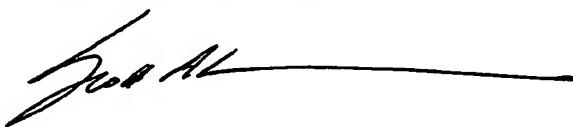
Dated this 5<sup>th</sup> day of February, 2004

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**ROBERT BOSCH GMBH**

By Their Patent Attorneys

CALLINAN LAWRIE



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FIG. 1

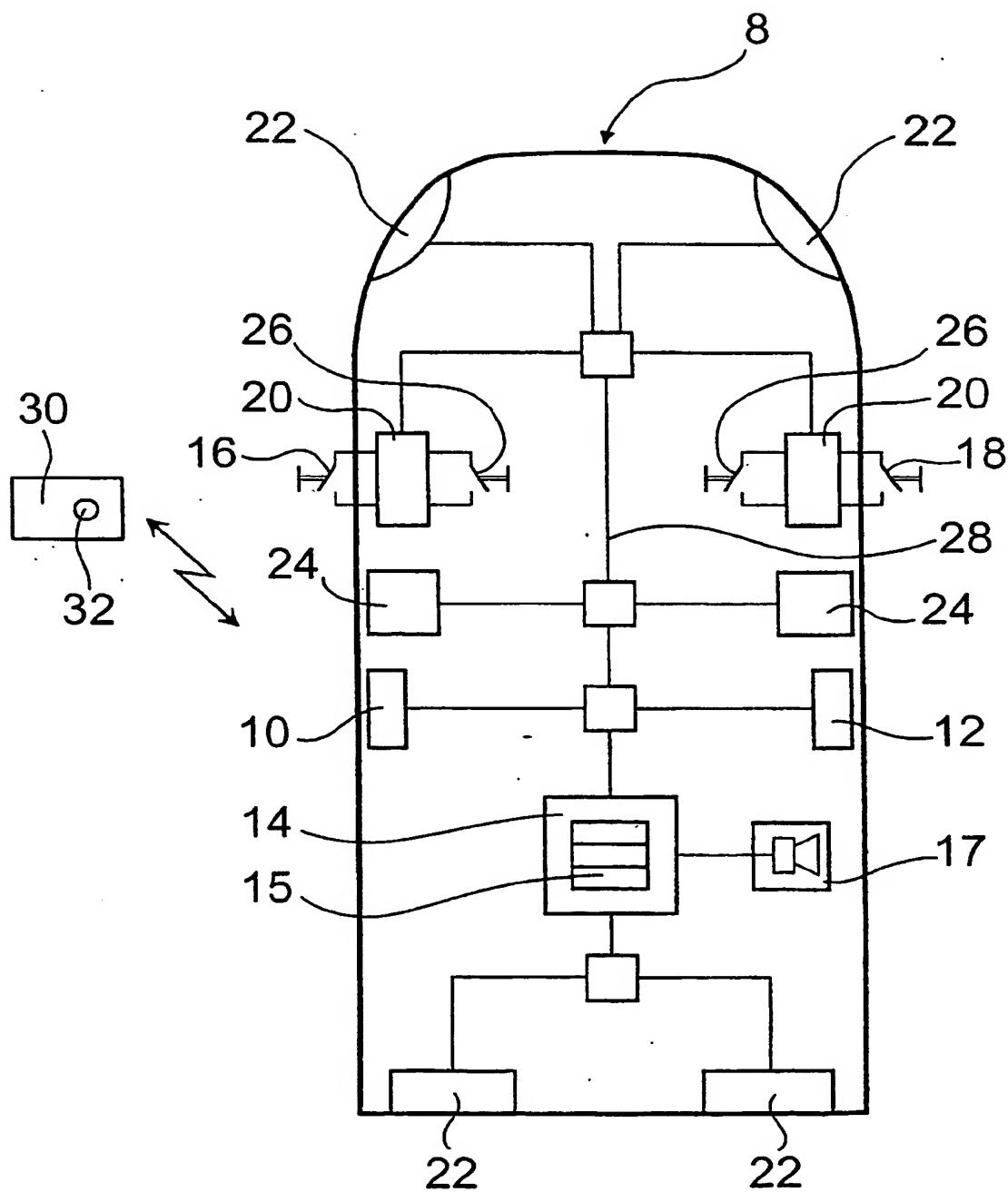
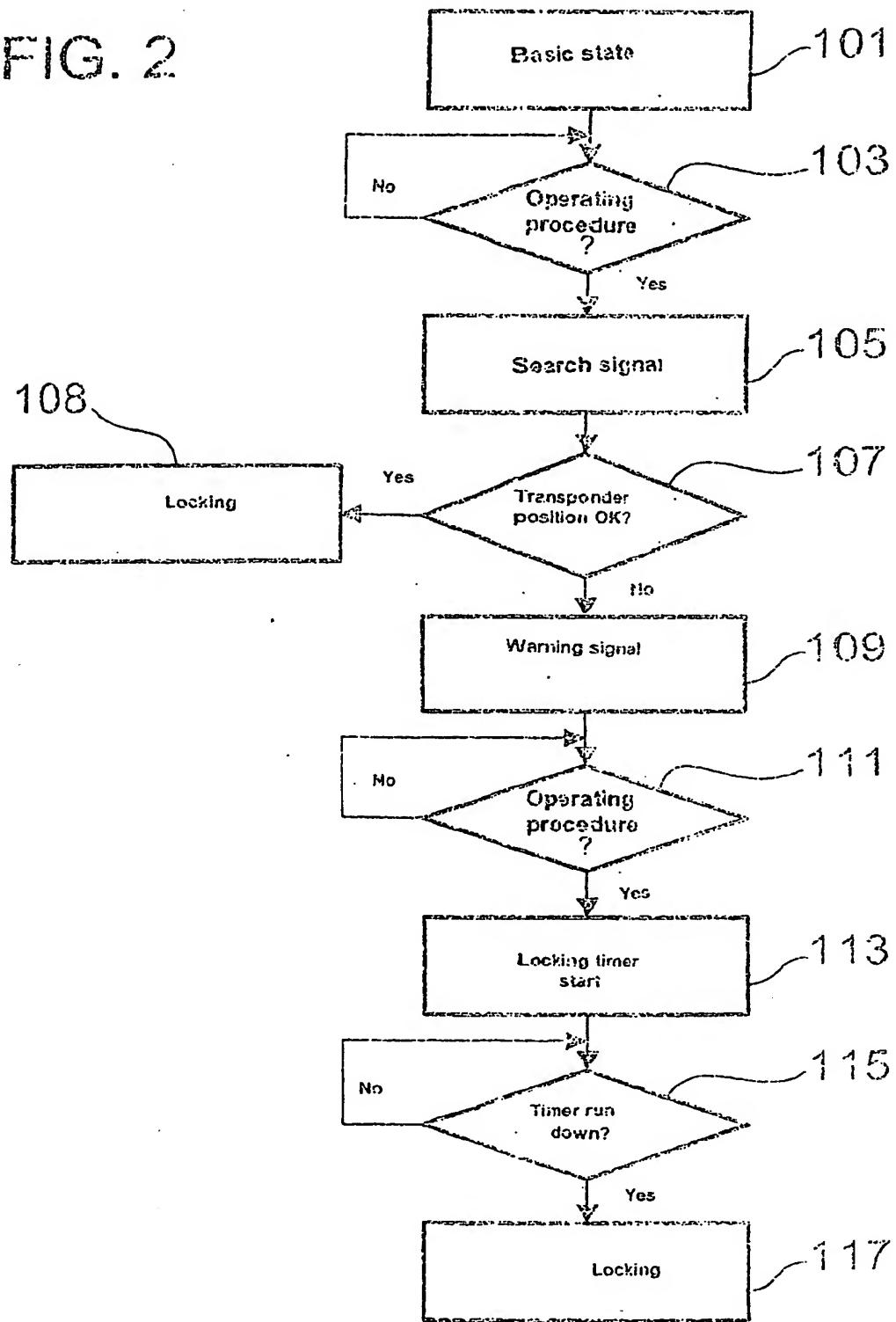


FIG. 2



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